



MOBILE HOME WEATHERIZATION SPECIFICATIONS¹
October 1, 2002

PART I-INSTALLATION PROVISIONS

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¹ These Mobile Home Weatherization Specifications were prepared by Bonneville in Cooperation with Regional Utilities, State Energy Organizations, and Product Manufacturers. These specifications appear in two parts: Part I is the Installation Provisions; and Part II is the Material Provisions.

101.000 INTRODUCTION

.005 These specifications provide minimum requirements for weatherization in order to claim deemed savings credits under Bonneville Power Administration's Conservation and Renewable Resources Rate Discount Program. Site-built additions shall be weatherized at the same time as the Mobile Home, using the site-built specifications.

.010 The Utility shall provide more descriptive Installer provisions to be used between the Contractor and Installers.

.015 These specifications are based on the most recently published codes and regulations. They are intended to meet or exceed applicable existing codes and regulations. Codes and regulations, however, are updated periodically or changed by State and local jurisdictions. Therefore, the specifications, codes, and regulations shall apply as follows:

- .1 Weatherization Measures shall be installed according to these specifications, HUD code, and all applicable state and local codes and federal regulations, which may include the most recent versions of the Uniform Codes and the National Electric Code;
- .2 where state or local code and specification requirements are in conflict, the most stringent requirements shall apply. and
- .3 if a specific application is not addressed in the specification, codes, or regulations, the Utility shall determine the appropriate action consistent with the codes and these specifications. Utility decisions in these instances shall be thoroughly documented in the Mobile Home file.

.020 Utilities may add more restrictive requirements than those in this specification and/or add their own requirements.

101.030 Definitions

In this specification, the following definitions apply.

101.030.1 Code

The most recent applicable Codes which may include HUD Code and the Uniform Codes written by the International Conference of Building Officials (ICBO) including the Uniform Building Code (UBC), the Uniform Mechanical Code (LJMC), Uniform Plumbing Code (UPC), Uniform Fire Code (UFC), and other associated codes and the National Electric Code (NEC) written by the National Fire Protection Association (NFPA) and applicable state codes.

102.000 SPECIFICATIONS FOR DETERMINING ELIGIBLE MEASURES AND USE OF WEATHERIZATION FUNDS

.005 The Utility shall determine the weatherization Measures eligible to be installed in each Mobile Home per this specification.

103.000 GENERAL REQUIREMENTS FOR UTILITIES

.005 All weatherization shall be completed to provide a safe, permanent, effective, and Workmanlike installation.

- .010 Materials, components or products installed under this Program shall meet the criteria defined in the Material Provisions, Part II of this Item.
- .015 Materials damaged in shipment or in assembly shall not be used.
- .020 Structural members and Building components shall be free of decay and structurally sound before weatherization Measures are installed.
- .025 The structure shall be properly supported, leveled and restrained (if required) at the Homeowner's expense before weatherization Measures are installed.
- .030 The Utility shall verify that the Installer has indicated, in writing, to the Homeowner or Homeowner Designee the types of materials to be used, methods of installation, identification of special problems, and other information which would minimize misunderstandings. The Utility shall also verify that the Installer has separately identified any unusual (but necessary) costs that affect the price of providing a safe, permanent, effective, and Workmanlike installation.
- .035 Weatherization materials, products and labor shall be warranted by the Installer against failure due to manufacturing and installation defects for at least 2 years from the installation date, except that sealed, insulated-glass units shall be warranted against failure of the seal for a minimum of 5 years. The Installer shall provide a written warranty, with the installation date, to the Homeowner or Homeowner Designee. Manufacturers' written warranties may be used by Installers to satisfy a part of this requirement where appropriate.
- .040 The Installer is responsible for checking clearances and access to crawl spaces before job commitment, and for making appropriate allowances for ducts, joists, or other installation obstructions.
- .045 The Installer is responsible for determining that the ceiling, floor, or wall systems are structurally adequate to support the combined weight of all materials imposed on the ceiling, floor, or wall. The Installer is also responsible for damage incurred during, or as a result of, the installation of any materials and associated work.
- .050 Installers shall provide all necessary permits, materials, and labor for installing weatherization Measures in the Residence.
- .055 The Utility shall verify the installation of insulation and air sealing by an in-progress inspection or other methods determined to be appropriate by the Utility. The Utility shall document the type of verification in the Consumer's permanent file.
- 104.000 **INSULATION**
 - .005 All insulation materials installed under this Program shall meet all applicable material requirements contained in the Material Provisions.
 - .010 Insulation shall be installed only in areas of the Mobile Home envelope that separate Conditioned Space and unconditioned or outside spaces where none exists or the R-value *is less* than that prescribed in this specification.
 - .015 The Utility shall maintain a copy of an Installer certificate for blown-in insulation in the Consumer's permanent file which contains the following information when insulation is installed in ceilings, walls, and/or floors:
 - .1 Address of the Residence;

- .2 date of Installation;
- .3 name and Address of Installer;
- .4 the estimated R-value of any existing insulation;
- .5 the amount, R-value, depth and type (including product name) of insulation installed by the Installer;
- .6 final R-value of insulation; and
- .7 area of the space (in square feet) insulated.

- .020 Exhaust-fan ducts terminating in ceiling cavities, crawl spaces, or other spaces, shall be extended through to the outside, and sealed to prevent exhaust air from returning back into the space.

104.100 **Health and Safety Requirements**

- .105 After installation, insulation materials, including facings, (except foam-plastic insulation-Specifications 104.115 and 104.120) shall meet the installation requirements of the Uniform Building Code 1713(c). Flame spread and smoke developed limitations do not apply to facings, IF the facing is installed in substantial contact with the unexposed surface of the ceiling, floor, or wall finish.
- .110 Recessed lighting fixtures and fan/light combinations that are Type-IC rated by UL may be covered with insulation. Fan/heater, fan/light/heater, and light/heater combinations may be covered with insulation IF they are rated "Heater" or "Air Heater."
- .115 Ventilation fans may be covered with insulation IF all holes and penetrations are sealed with a nonflammable sealant.
- .120 Only fluorescent fixtures with appropriate thermal protection shall be covered with insulation.
- .125 Thermal insulation shall not be installed within 3 inches of fans, lights, and heaters that do not meet the requirements of 104.110 through 104.120 and other heat producing fixtures, and shall not be installed so as to entrap heat and prevent the free circulation of air (NEC 410-66). Solid, flame-resistant baffles attached to the ceiling structure shall be used to maintain required clearances. Fixtures may be replaced with fixtures rated as Type-IC, Heater, or Air Heater at the homeowner's expense.

All combustible insulation materials shall be kept at least 2 inches from metal flues and chimneys. Noncombustible insulation may be installed with no clearance around flues and chimneys if permitted by local or state fire code. However, if the flue is a single-wall type (i.e., made from a single thickness of rolled sheet metal), a 2-inch air clearance to all insulating materials shall be maintained. Noncombustible insulation material conforms to the ASTM E-136-82 standard test method.

- .130 Kitchen-range exhaust fans vented through the ceiling shall be connected to a duct of not less than 30-gauge galvanized steel (UMC Chapters 10 and 11) which is substantially airtight throughout and which terminates directly to the outside in a vent cap. Operable, functional backdraft dampers are required. Existing installations that substantially meet these requirements are acceptable.
- .135 Kitchen-range exhaust fans which are vented to the crawl space shall be ducted through the skirting according to the manufacturer's instructions.
- .140 Insulation shall not be installed in wall cavities which contain electric space heaters unless fire stops are present which isolate the heater from all contact with the insulation

material. Verification shall be accomplished by removing the heater after the insulation is installed.

- .145 Pipe insulation shall not be installed on pressure/temperature relief valves, on the operating portion of any valves, or on any other control and safety devices.
- .150 Exposed facings or protective coverings used on pipe or duct insulation shall meet Code flame-spread and smoke-development requirements.
- .155 When water-pipe heaters are used for freeze protection, they shall include a thermostat set at approximately 35 degrees Fahrenheit.
- .160 All combustion appliances, except gas cooking appliances and gas clothes dryers, shall have outside combustion air ducted directly to the appliance. Fireplaces and wood-burning stoves shall have tight-fitting glass or metal doors that cover the entire opening of the firebox.
- .165 All aluminum wiring should be tightened at switch and outlet connections.

104.200 Installation Provisions for Ceiling Cavities, Mobile Homes

- .205 Ceiling cavities under flat or crowned metal roofs shall be insulated by completely filling them with blown-in insulation and sealing all existing attic ventilation except existing roof jacks. It is recommended that this application be done in conjunction with Section 104.300 because of concerns about the potential for moisture condensation.
- .210 Ceiling cavities under flat or pitched roofs shall be insulated to R-38 or to the maximum practical R-value, and ventilated to 1 ft² for each 300 ft² of ceiling area.
- .215 All penetrations through the ceiling shall be sealed before ceiling cavities are insulated.
- .220 If the ceiling cavity contains a non-ducted return-air system, the return-air system shall be eliminated as described in Section 104.1430.

104.300 Installation Provisions for Roofs-Exterior Surface, Mobile Homes

- .305 If exterior roof insulation is installed, it shall be a minimum of R-7. Exterior roof insulation shall not be installed over ventilated ceiling cavities or over cavities containing air spaces.
- .310 Roof drainage systems shall function properly after weatherization has been installed.
- .315 Weatherproof roof coverings shall be applied directly over the insulation. Costs associated with providing a weatherproof roof or roof membrane shall not be covered under this Program.
- .320 All penetrations through the roof covering and all joints between the roof covering and vertical surfaces (e.g., walls, chimneys, etc.) shall be flashed.
- .325 Other methods of installing exterior roof insulation shall be approved by the Contractor in writing prior to beginning the work.

104.400 Installation Provisions for Ramada Roofs, Mobile Homes

- .405 A ramada roof is a free standing (self supporting) covering over a Mobile Home.

- .410 The ramada roof shall be joined to the Mobile Home to create an enclosed attic cavity at the homeowner's expense. The ramada roof shall be weatherproof and be joined to prevent the entry of birds, animals, etc.
- .415 The attic cavity shall meet the ventilation requirements of the site-built specifications.
- .420 All exhaust-fan ducts, plumbing vent stacks, etc., shall be extended outside and have a proper termination.
- .425 All heat producing fixtures shall be protected according to the site-built weatherization specifications.
- .430 The original roof cap of the Mobile Home shall be opened to allow a full fill of insulation inside the cap. Insulation shall be installed above the original roof to provide an installed level of R-38. The openings in the original roof shall NOT be sealed.
- .435 All penetrations through the ceiling shall be sealed before the insulation is installed.

104.600 Installation Provisions for Underfloors, Mobile Homes

- .605 All HVAC ducts and plenums shall be inspected for leaks or openings, and all leaks or openings repaired and sealed, before underfloor insulation is installed. Non-ducted return-air systems in the floor cavity shall be eliminated. See Section 104.1400.
- .610 All plumbing penetrations through the floor (e.g., bathtubs, clothes washers, sinks, etc.) shall be sealed before underfloor insulation is installed.
- .615 Insulation shall be protected by a moisture permeable covering or skirting which shall be installed at the homeowner's expense before underfloor insulation is installed. Skirting shall be as close to the ground as practical.
- .620 A minimum of R-19, or the maximum R-value achievable to fill the floor cavity, shall be installed. Special care shall be taken when insulating the floors of tip-outs or expandos.
- .625 Where required by State or local codes, a moisture permeable rodent barrier shall be in place and in good repair after the insulation is installed.
- .630 All exhaust ducts, such as those for kitchen ranges and dryers, shall be extended to the outside of the crawl space and sealed to prevent exhausted air from returning to the crawl space and/or the Mobile Home when skirting exists.
- .635 All water drains, including condensate drains from air conditioning equipment, shall be extended outside the crawl space.
- .640 All water pipes that have not been insulated by the floor insulation, shall be insulated to at least R-3 for freeze protection. Water-pipe insulation costs shall be included with underfloor insulation and be installed according to Specification 104.1600.
- .645 Water-pipe heaters may be installed in localities with sustained periods of subfreezing winter temperatures. Such heaters shall include a thermostat set at approximately 35 degrees Fahrenheit. They shall be placed around all water pipes (both hot and cold water) in the crawl space, inside the pipe insulation, and in contact with the pipe surface. Such installations shall conform to the National Electric Code and any applicable state or local code.

- .650 Underfloor insulation support systems shall be installed so that the insulation remains in contact with the sub-floor, flat and in place for the life of the Residence. Support of the insulation may be provided by wood lath, twine, wire, or other material as approved by the Utility.
- .655 Vapor retarders installed as a part of floor insulation shall have a perm rating of 1.0 or less and shall be located between the insulation material and the Conditioned Space.
- .660 After underfloor insulation has been installed, an acceptable ground-cover moisture barrier shall be present (new 6 mil black polyethylene or existing 4 mil polyethylene) where skirting exists. All joints shall be overlapped with sufficient material so that all ground surface area is covered.

Ventilation Requirements

- .665 When skirted, the entire enclosed underfloor crawl space area shall be ventilated by openings in the skirting. Such openings shall have a net area of not less than 1 square foot for each 150 square feet of underfloor area, including the crawl space area of all structures which open to that of the Mobile Home.

Where moisture due to climate and groundwater conditions is not considered excessive, the Utility may allow operable louvers and may allow the required net area of vent opening to be reduced to 1/300 or less (minimum 1/1500), provided the underfloor ground-surface area is covered with an approved ground cover. Openings shall be located as close to corners as practical and shall provide cross ventilation. The required area of such openings shall be approximately equally distributed along the length of at least two opposite sides. They shall be covered with corrosion-resistant wire mesh with maximum mesh openings of 1/4-inch. Existing vent openings which are covered with wire mesh need not be modified.

- .670 If crawl space ventilation cannot be installed to meet these requirements, underfloor insulation shall not be installed.

104.1300 Installation Provisions for Exterior Wall Cavities, Mobile Homes

- .1305 Wall cavities shall be completely filled with blown-in or batt insulation to the highest practical R-value and all wall penetrations shall be sealed. The bottom outside edge of ventilated walls shall **NOT** be sealed.
- .1310 Blown-in insulation shall be installed using an insert-tube. Other installation methods, such as batt stuffing may be approved by the Contractor.
- .1320 The Contractor shall verify the installation of insulation by an in-progress inspection or other methods determined to be appropriate by the Contractor. The Contractor shall document the type of verification in the Consumer's permanent file.

104.1400 Installation Provisions for HVAC Ducts, Mobile Homes

- .1405 All HVAC ductwork, including plenums, shall be repaired, sealed and properly supported before underfloor insulation is installed.
- .1407 All new and all accessible existing HVAC supply and return ducts, air handlers, and plenums inside and outside the heated space shall be sealed at all joints and corners, including prefabricated joints, with duct mastic. Tape is not allowed except for use on operable doors in the system such as on the air handler. In this case, foil tape with a

15-mil butyl sealant shall be used; alternately, the joints can be cleaned with a suitable solvent and sealed with a UL-181 listed tape.

- .1410 Any portion of an HVAC duct that extends beyond the last register shall be sealed.
- .1415 The crossover ducts shall be installed to prevent compressions or sharp bends, minimize stress at the connections, avoid standing water, and avoid excessive duct lengths. When skirting is not present, the crossover duct shall be protected against rodents, pets, etc.
- .1420 Flexible crossover ducts shall have a minimum R-8 insulation. They shall be secured with mechanical fasteners (e.g., stainless steel worm drive clamps, plastic/nylon straps applied with a tightening tool, etc.) and sealed with mastic or aluminum/foil backed butyl or equivalent sealant tape. Existing flexible crossover duct with an insulation value of R-4 or less and which has been damaged may be replaced with new flexible duct with an insulation value of R-8.
- .1425 Where clearances permit, the crossover duct shall be supported above the ground by strapping or blocking.
- 104.1430 If a nonducted return-air system is in the floor or ceiling cavity, it shall be eliminated. Seal all return-air openings in the floor or ceiling and Seal the main return-air opening in the floor or ceiling of the furnace closet. Return air shall be provided through grills in the furnace closet to the heated space. These grills shall be adequately sized for the installed heating system. All interior doors shall be undercut to allow return air to flow back to the furnace closet.
- .1435 If the belly board/rodent barrier has been removed and batt insulation has been installed in the floor, all HVAC ducts, boots and plenums, except flexible crossover ducts, shall be wrapped with R-11 insulation.
- 104.1600 **Installation Provisions for Water Pipe Insulation, Mobile Homes**
 - .1605 Water pipes that have not been covered by underfloor insulation shall be insulated to a minimum of R-3.
 - .1610 The piping shall be free from water leaks and properly secured to support the weight of the piping and insulation.
 - .1615 The product may be either flat and capable of being molded to the outside surface of common pipe sizes, or preformed to fit standard pipe diameters. If the product is preformed, dimensions shall be appropriate for the pipe size intended to be insulated.
 - .1620 If insulation is installed on piping exposed to the weather, it shall be resistant to degradation from moisture, ultra-violet light, and extremes in temperature, or a jacket or facing shall be installed that protects the insulation from these conditions. Manufacturer's recommendation for outdoor installations shall be followed in all cases.

105.000 **INSTALLATION PROVISIONS FOR PRIME WINDOWS** **-MOBILE HOMES**

- .005 Storm windows, vent conversions and fin-bar conversions are not acceptable under this program. New prime windows and patio doors (french or Sliding) that are Energy Star[®] labeled for the Northern Climate Zone may replace existing dual-glazed windows in non-wood or vinyl framed windows or single-glazed windows regardless of frame type.

105.400 General Installation Provisions

- .405 Window frames shall be permanently affixed to the Residence. Upon installation completion, units shall operate smoothly and properly. Hardware shall be durable, and function properly.
- .415 Correct size, shape, and type of windows for the openings shall be assured by the Installer. Each one shall be Measured for appropriate clearances and "out-of-squareness". The window may need to be adjusted to be square, plumb, and level without distortion to the window parts, upon installation.
- .420 Any installation that results in increased window area shall not be allowed under this Program.
- .425 No windows shall have exposed burrs, sharp corners or other conditions that could cause injuries to the occupants during normal use.
- .430 All replacement prime windows shall be NFRC labeled and certified and meet the Energy Star[®] requirement with a maximum U-factor of 0.35.
- .435 Installation procedures shall ensure that the integrity of the multiglazed seal is maintained.
- .440 Glazing compounds shall not contact the seal of the multiglazed unit or the material shall be shown to be chemically compatible with the seal of the multiglazed unit.

105.500 Health and Safety Requirements

- .505 Safety glass shall be used under the following conditions:
 - .1 Glazing in entrance doors.
 - .2 Glazing in fixed and sliding panels of sliding doors and panels in swinging doors other than wardrobe doors.
 - .3 Glazing in fixed or operable panels adjacent to a door where the nearest exposed edge of the of the glazing is within a 24-inch arc of either vertical edge of the door in a closed position and where the bottom edge of the glazing is less than 60 inches above the floor or walking surface unless there is an intervening wall or permanent barrier between the door and the glazing.
 - .4 Glazing in an individual fixed or operable panel other than those covered by 105.505.3 above that meet ALL of the following conditions:
 - a. Have an exposed area of an individual pane greater than 9 square feet.
 - b. Has an exposed bottom edge is less than 18 inches above the, floor.
 - c. Has an exposed top edge greater than 36 inches above the floor.
 - d. Has one or more walking surfaces within 36 inches horizontally of plane of glazing.

In lieu of safety glazing, such glazed panels may have a protective, bar installed on the accessible sides of the glazing 34 to 38 inches above the floor. The bar shall be capable of withstanding a horizontal load of 50 pounds per linear foot without contacting the glass and be a minimum of 1 1/2 inches in height.

- .5 Glazing in any portion of a building wall enclosing showers, hot tubs, whirlpools, saunas, steam rooms, and bathtubs where the bottom exposed edge of the glazing is less than 5 feet above a standing surface and drain inlet.

Each pane of each safety glass lite shall be marked with the name of the manufacturer and place of manufacture, and shall certify compliance with all applicable standards for the manufacture and testing of safety glass (e.g., CPSC Class 2).

- .515 Retrofitted vertically-opening prime windows shall not free fall.

106.000 INSTALLATION PROVISIONS FOR DOORS, MOBILE HOMES

RESERVED

107.000 INSTALLATION PROVISIONS FOR AIRSEALING, MOBILE HOMES

107.100 Prescriptive Airsealing

- .105 All gaps, holes, joints and seams in HVAC ducts and plenums shall be sealed. This includes blocking off all ducts just beyond the last register, sealing all joints from the furnace to the plenum, the plenum to the main duct, the boots for each register to the main duct, the boots for each register to the floor. Seal all branch-duct to main-duct connections when necessary.
- .110 All gaps and holes where HVAC ducts, plenums and registers penetrate the envelope shall be sealed.
- .115 All plumbing penetrations, including those in water heater closets, shall be sealed. Place special emphasis on penetrations for bathtub, sink, and clothes washer drains.
- .120 All gaps between exhaust-fan ducts and the envelope, including those, for kitchen ranges, bathrooms and clothes dryers, shall be sealed. All exhaust ducts shall have functional, operable backdraft dampers.
- .125 All gaps between the ceiling for swamp cooler ducts shall be sealed.
- .130 The entire length of marriage lines and the joints for tip-outs, expandos and add-on rooms shall be sealed.
- .135 All electrical penetrations, including the electrical service panel shall be sealed.
- .140 All air bypasses in electrical/plumbing chases and around chimneys, flues, etc., except for single-wall metal flues, that penetrate floors and ceilings shall be sealed with 5/8-inch, Type-X sheet rock.

109.000 INSTALLATION PROVISIONS FOR CLOCK THERMOSTATS, MOBILE HOMES

- .005 Clock thermostats may be installed when determined to be appropriate by the Utility. Existing thermostats on the exterior wall shall have the wiring provided on an interior wall at the homeowner's expense before a clock thermostat can be installed.

109.100 Installation Provisions

- .105 Clock thermostats shall be installed in compliance with local codes and the manufacturer's instructions.

- .110 The Installer shall provide written instruction materials to the Homeowner or Homeowner Designee. The Installer shall also explain the clock thermostat's operation and method of adjustment to one or more members of the Residence.

111.000 **INSTALLATION PROVISIONS FOR ELECTRIC WATER HEATER CLOSETS, MOBILE HOMES**

- .005 The exterior access door and associated exterior walls of closets containing electric water heaters shall be insulated to a minimum of R-11. The water heater shall NOT be wrapped.
- .010 The exterior door to closets containing electric water heaters shall be weatherstripped, and any existing ventilation vents shall be sealed.
- .015 All penetrations through the walls, ceilings, or floors of the water heater closet shall be sealed.
- .020 For gas-fired water heaters, the walls of the water heater closet adjacent to heated space shall be insulated and combustion air vents shall not be sealed. The exposed surfaces of the insulation shall have a flame spread rating of 25 or less and maintain code required clearances to the furnace.

114.000 **MECHANICAL VENTILATION**

- .005 A mechanical ventilation system meeting either the requirements of 114.100, 114.200, 114.300, or 114.400 shall be installed in all homes.
- .100 **Non-Heat-Recovery Ventilation - Intermittent Operation**
- .105 A bathroom exhaust fan is controlled by both a manual switch, crank timer or dehumidistat in the bathroom to provide spot ventilation AND a time clock to provide whole-house ventilation when called for by the timer. Outside-air inlets in all living areas and bedrooms, and undercut doors, grills, transoms, or other approved means provide fresh-air circulation through the house to the bath fan.
- .110 Exhaust ducts shall be smooth metal and terminate outside the house at the closest possible location. All connections shall be tight fitting and taped or sealed, and backdraft dampers shall be provided.
- .115 The minimum exhaust airflow rates shall comply with either the performance OR prescriptive paths listed below. Surface-mounted fans shall have a sone rating of 1.5 or less, or other rating as approved by the Contractor. Existing fans that meet the minimum airflow rates are exempt from the sone rating requirement.

- .1 **Performance Path:** The minimum measured airflow capacity shall be either 0.35 air-changes per hour (ACH) or those listed below:

Number of	Measured Exhaust
Bedrooms	Flow
1	45 cfm
2	60 cfm
3	75 cfm
4	90 cfm

To calculate the ACH for a fan with a MEASURED airflow of 45cfm multiply by 60 to obtain the airflow per hour (45 X 60 = 2700 cfh) and divide by the volume of the heated space.

- .2 **Prescriptive Path:** Ventilation systems that do not meet the performance path shall provide 0.35 ACH based upon the rated fan flow minus 15 cfm or use the rated fan flows in the following table:

Number of		
Bedrooms		Rated Fan Flow
1		70 cfm
2		85 cfm
3		100 cfm
4		115 cfm

To calculate ACH based on the RATED airflow, subtract 15 cfm, multiply by 60, and divide by the volume of the heated space.

- .120 The fan shall have both automatic and manual controls. Automatic controls shall include a time clock or cycle timers with a minimum of 2 on-periods per day, a manual control switch to let the occupant turn the fan on or off, and be set to operate a minimum of 8 hours per day.

- .125 The ventilation fan shall be wired to both the manual spot-ventilation switch in the bathroom and to a time clock.

- .130 Individual outside-air inlets, located to avoid drafts, shall provide a minimum of 4 square inches per bedroom and combined living area.

If a whole house blower door test, in accordance with Appendix T and conducted after air sealing measures are installed, results in an $ACH_{50} \div 20$ greater than 0.35 and the house has no combustion appliances capable of backdrafting (i.e., naturally vented or atmospheric chimneys) within the exterior shell of the house, outside-air inlets may be omitted.

- .135 The outside-air source shall be located at least 3 feet from exhaust vents and to minimize drawing outdoor pollutants and excessive outdoor noise inside during operation.

- .140 The outside-air source shall limit excessive airflows during normal operation and have a weather protection hood and maximum 1/4" screen-mesh, or as approved.

114.200 Unbalanced Non-Heat-Recovery Ventilation-Continuous Operation

- .205 This system uses a continuously-operating fan to exhaust air at a minimum rate of 25 cfm for the kitchen, and 20 cfm for each bathroom, with a maximum rate of 0.5 ACH. One fan exhausting from the kitchen and each bathroom also provides spot ventilation. An integrated spot and whole-house fan is acceptable if spot ventilation is also provided for the kitchen and for the bathrooms. .

- .210 The exhaust-air pickup in the kitchen shall not be over the kitchen range.

- .220 If the exhaust flow from each kitchen and bathroom is not measured, the rated fan capacity shall exceed the required flow rate by a minimum of 15 cfm.

- .225 The continuous ventilation fan(s) shall be wired to an existing circuit or to the electrical service panel.
- .230 The outside-air inlet and source requirements shall be the same as Sections 114.105, 114.130, 114.135, and 114.140.

114.300 Balanced Flow Non-Heat Recovery Ventilation-Continuous Operation

- .305 Balanced flow non-heat-recovery air exchange units shall:
 - .1 Have fans capable of providing the intake and exhaust airflow rates in section 114.115 at 0-25 inches of water gauge as determined by HVI 916 (July 1993);
 - .2 provide complete isolation of the intake and exhaust air;
 - .3 have UL approval of all electrical components (see Specifications Nos. 210.030, .035, .040, .045 for more information);
 - .4 have outside-air inlets in all living areas and bedrooms, positioned so-as-to avoid drafts; and
 - .5 be installed according to the manufacturers instructions.

114.400 Air-to-Air Heat Exchangers

- .405 Air-to-air heat exchangers shall:
 - .1 Provide the ventilation rates in Section 114.115;
 - .2 have a minimum sensible heat recovery efficiency of 65 percent at 117 cfm and 32°F for homes larger than 1300 ft² and 55 percent at 64 cfm and 32°F for houses of 1300 ft² or less as certified by the Home Ventilation Institute (HVI);
 - .3 have a filter on the upstream side of the heat exchanger in both the intake and exhaust airstreams;
 - .4 provide protection against ice buildup that does not disable the unit during freezing weather; and
 - .5 be installed according to manufacturer's instructions.

114.500 Other Mechanical Ventilation Systems

- .505 Other mechanical ventilation systems meeting the Super Good Cents for Manufactured Housing specifications may be used if approved by Bonneville.

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202.000 GENERAL MATERIAL PROVISIONS

- .005 Materials, components or products installed under the Conservation and Renewable Resources Rate Discount Program (C&R Discount Program) shall meet the criteria defined in this specification. Materials, components or products shall be submitted to the Utility or Bonneville for evaluation and have written acceptance before installation. Product evaluation shall be based on test results from a mutually acceptable independent laboratory indicating compliance to the requirements in this specification.
- .010 The Utility or Bonneville reserves the right to identify and disapprove for use in the C&R Discount Program, any weatherization product at any time when it deems the product not satisfactory for the C&R Discount Program.
- .015 Where written acceptance of materials, components, or products is required, the intent is that, unless otherwise stated in the specification or the acceptance, once it is accepted by a Utility or Bonneville, for one installation, the material, component, or product shall be acceptable for all other similar installations without resubmittal to the Utility or Bonneville except as noted in Specification 202.010 above.
- .020 The Utility may decide that a product or its installation is unsatisfactory after an inspection is performed even if that product has been accepted previously by the Utility or Bonneville. A rejection based on the installation may require the Installer to correct the work done. Also, the Utility has the right to disapprove the use of the product on all future jobs.
- Such disapproval shall be issued in writing and shall identify the flaws found in the product or its installation. The Utility shall notify Bonneville, of any products which are disapproved.

- .025 All materials used under the C&R Discount Program shall be resistant to corrosion, degradation from ultraviolet light, and be compatible with other elements and materials (will not react chemically, etc.) to enhance the life expectancy of installed Measures.

204.000 INSULATION MATERIAL PROVISIONS

- .005 The American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals (1989 or later) is the accepted standard for R-value/U-value of materials used by Installers. Products that vary from ASHRAE may be acceptable if they comply with current Federal Trade Commission (FTC) certifications, testing and labeling rules, and have independent laboratory testing which indicates the product's R-value/U-value.

204.010 All thermal-insulation materials shall meet the requirements of Sections 1712 and 1713 of the UBC and those in the applicable Federal specifications listed below.

.1	Mineral Fiber Blankets/Batts	HH-1-521F
.2	Mineral Fiber Loose-Fill	HH-1-1030B
.3	Cellulose Loose-Fill	ASTM C-739-86
		16 CFR 1209
		16 CFR 1404
.4	Perlite	ASTM C-549-81
.5	Vermiculite	ASTM C-516-80
.6	Polystyrene Board	ASTM C-578-87A
.7	Polyurethane and	
	Polyisocyanurate Board	HH-1-530B

- .015 In addition, loose-fill cellulose manufacturers shall subscribe to an ongoing laboratory quality control inspection Program substantially equivalent to the "UL classification" Program. This Program periodically verifies the manufacturer's adherence to the requirements of CPSC cellulose regulation 16 CFR 1209 (i.e., critical radiant flux, smoldering combustion, settled density, and corrosiveness).

Also, the UL or equivalent label shall appear on every bag of material. It shall include the file number (R-number) of the manufacturer and the issue number for labels purchased.

- .020 All insulation materials installed shall meet the requirements of the Federal Trade Commission Labeling Rule (16 CFR 460). Additional labeling on weatherization materials may be required under the RCS regulations for covered utilities.

- .025 Urea-Formaldehyde foam insulation is not acceptable.

- .035 Duct insulation for use in unconditioned areas on ducts not subject to routine human contact shall meet the requirements of Federal Specification HH-1521F, any type.

For ducts subject to routine human contact during servicing or storage activities, (e.g., in garages, basements, attics used for storage) the insulation shall meet HH-1-521F and

either be classified as Type 2 or 3, Class A (reflective or non-reflective, flame rated, faced batts) material. Faced material shall have a covering which provides physical protection to the insulation and has a flame spread of 50 or less when tested in accordance with ASTM E-84-88 when used on duct systems which serve single Residences only.

In Buildings having a duct system which serves more than one Residence, the covering shall have a flame spread of 25 or less when tested in accordance with ASTM E-84-80.

.040 Pipe insulation shall meet the following provisions:

1. Pipe insulation materials shall be comprised of mineral fiber, elastomers, urethanes, isocyanurates, or other suitable materials.
- .2 The material shall be capable of withstanding continuous operating temperatures of not less than 180 degrees Fahrenheit.
- .3 The product shall be finished with a jacket or facing, suitable to resist damage and degradation. However, if the product is made of closed cell foam and is installed in a location protected from moisture, ultraviolet light and extremes in temperature, a protective jacket or facing is not required.
- .4 The insulation material, any jackets or facings, and adhesive, if used, shall be tested as a composite product and shall have a flame spread rating of 25 or less, and a smoke density of 50 or less when tested according to ASTM E-84-88.

205.000 **WINDOW MATERIAL PROVISIONS**

- .005 Prime replacement windows shall meet the Energy Star[®] specifications for the Northern Climate Zone and shall be NFRC labeled and certified to have a maximum U-factor of 0.35.
- .030 Meeting rails of movable windows shall be provided with a durable, effective, infiltration barrier and shall include a mechanical interlock or equivalent mechanism. All sliding panes or associated channels shall be fitted with infiltration and weather barrier devices.
- .035 Vertically-moving windows shall hold the sash secure and level in ventilating positions.
- .050 Security latches are required on all prime window replacements.
- .060 Each safety-glass lite shall be marked with the name of the manufacturer and place of manufacture, and shall certify compliance with all applicable standards for the manufacture and testing of safety glass (e.g., CPSC Class 2).

206.000 **DOOR MATERIAL PROVISIONS**

RESERVED

207.000 **WEATHERSTRIPPING MATERIAL PROVISIONS**

- .005 Products used in the Program shall be designed to resist deterioration when subjected to sunlight, moisture, other weather conditions, and normal use.

.010 Weatherstripping shall be of the following types:

- .1 Hollow, cold weather, vinyl tube type or vinyl-silicone composite material which is affixed to a prepunched aluminum flange or extrusion;
- .2 spring metal cushion weatherstrip;
- .3 cold weather vinyl type or vinyl-silicone composite material which is affixed to a prepunched aluminum flange, or extrusion;
- .4 interlocking metal weatherstrip;
- .5 two-piece, magnetic bellows-type weatherstrip;
- .6 vinyl bulb or vinyl-silicone composite material with a semirigid flange; or
- .7 polypropylene replacement pile.

Other types of weatherstripping material shall be submitted to the Contractor for examination and written approval prior to use.

208.000 CAULKING MATERIAL PROVISIONS

.005 Caulking shall be one of the following materials conforming to the Federal Specifications listed below or material demonstrating equivalent performance in resiliency and durability:

- | | | |
|----|---|--------------|
| .1 | Silicone Rubber | TT-S-1543A |
| .2 | Polysulfide or Polyurethane
(single component) | TT-S-230C |
| .3 | Polysulfide or Polyurethane
(multiple component) | TT-S-227E |
| .4 | Acrylic Terpolymer
(single component) | TT-S-230C |
| .5 | Butyl Rubber | TT-S-1657 |
| .6 | Acrylic Latex | ASTM C834-76 |

208.010 The cartridge or tube containing the caulking material shall be labeled in indicating conformance to the applicable Federal Specification.

209.000 CLOCK THERMOSTAT MATERIAL PROVISIONS

.005 The clock thermostat ("low-voltage" and "line voltage" types) shall meet the requirements of NEMA DC 3-1984.

.010 The clock thermostat shall be easily Programmable by the Homeowner or Homeowner Designee and shall be at least a 24-hour type. Seven-day clocks are preferred. In addition, the thermostat shall allow for at least two separate setback periods per day (i.e., day as well as night setback). Where central air conditioning (or a heat pump) is present, the thermostat shall allow for summer "setup" as well as winter "setback" control.

- .015 The clock thermostat shall have independent adjustment capability for the "high" and "low" temperature set points.
- .020 Thermostats used with heat pumps shall be capable of restricting the use, of electric resistance elements during the normal temperature pickup periods. Such thermostats shall be designed so that the temperature pick up is accomplished by using heat pumping as much as possible and electric resistance elements only when necessary. This may be accomplished either by inhibiting electric resistance elements or by applying an electronic control technique which allows for the operation of electric resistance elements only when the heat pump will be unable to attain the setpoint within a suitable recovery time. The Contractor or Bonneville shall approve each heat pump thermostat model, in writing, prior to installation.
- .025 Line voltage clock thermostats shall be tested and meet minimum performance requirements of Canadian Standards Association C273.4-MI978 or other equivalent test procedures and standards.

214.000 CROSSOVER DUCT MATERIAL PROVISIONS

- .005 Crossover ducts shall have a minimum labeled insulation of R-8 and shall have an exterior vapor retarder rated at 1.0 perms or less.
- .010 Crossover ducts shall have an inner liner material which includes a spring-steel wire helix bonded within two layers of 57-gauge or thicker mylar film.

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